TVH

TIE- JA VESIRAKENNUSHALLITUS

POLTTOAINEEN KULUTUSMALLIEN ESTIMOINTI VUODEN 1985 TESTIAINEISTOSTA

TALOUSOSASTO - TUTKIMUSTOIMISTO

SARJA B 2 / 1986

AJOANALYSAATTORITUTKIMUKSIA 1 / 86

Sisällysluettelo Sivu

ALKUSANAT

Tämän tutkimuksen tarkoituksena on ollut selvittää ajoanalysaattoriauton polttoaineenkulutusta nopeuden ja koetieosalla vallinneiden tuuliolosuhteiden funktiona. Tavoitteena on ensisijaisesti ollut määrittää uuden mittausauton polttoaineenkulutukselle vastaavat mallit, jotka on tehty edellisillekin analysaattoriautoille. Näin on pyritty tekemään eri autoilla saadut tutkimustulokset keskenään vertailukelpoisiksi ja samalla laajentaa erillisistä tutkimuksista saatujen tulosten yhteensoveltuvuutta.

Tutkimusaineiston on käsitellyt ja koonnut tekn.yo Jukka Räsänen talousosaston tutkimustoimistossa ins. Arto Tevajärven opastuksella.

POLTTOAINEEN KULUTUSMALLIEN ESTIMOINTI 1985 TESTIAINEISTOSTA

1. JOHDANTO

Tämän selvityksen tarkoituksena oli määrittää ajoanalysaattoriauton polttoaineenkulutus eri nopeuksilla ja erilaisissa tuulioloissa.

Ajoanalysaattorimittauksia on TVH:ssa tehty vuodesta 1967 alkaen. Käytössä on ollut monen merkkisiä ja mallisia autoja, mutta vuodesta 1982 ovat kaikki analysaattorimittausten tekijät (TVH, VTT ja TTKK) käyttäneet Talbot 1510 GL -henkilöautoja. Näin tuloksetkin on saatu paremmin vertailukelpoisiksi.

Kevääseen -85 asti talousosaston tutkimustoimistolla oli käytössään 1,3-litraisella moottorilla varustettu 4-vaihteinen malli. Sen jälkeen tutkimukset on tehty 1,5-litraisella 5-vaihteisella autolla. Koska tekeillä oli pitkäaikaisia seurantatutkimuksia (Mikkelin ohitien vaikutukset), haluttiin selvittää uuden ja vanhan auton erot, jotta aikaisempia ja tulevia mittauksia voitaisiin vertailla. Lisäksi voitiin laskea 4- ja 5-vaihteiden kulutusero eri nopeuksilla.

Ajo-ohjelman laati ja mittausajot suoritti työryhmä, johon kuuluivat tekninen harjoittelija Noud Cornelissen Hollannista ja tekn.yo Kirsi Uotila. Ajot tehtiin heinä-elokuussa 1985. Tulokset käsitteli ja tutkimusraportin laati tekn.yo Jukka Räsänen.

2. MITTAUSMENETELMÄ

2.1 Ajoanalysaattorin kuvaus

Ajoanalysaattori on autoon sijoitettava laite, jolla voidaan mitata polttoaineen kulutus, kuljettu matka, hetkellinen nopeus ja aika. Lisäksi sillä voidaan rekisteröidä ajo- ja liikennetapahtumia manuaalisen näppäimistön avulla.

Auton polttoainejärjestelmään on kytketty virtausmittari, joka antaa jännitepulsseja, joiden määrä on verrannollinen kulutettuun polttoainemäärään. Vastaavalla tavalla kuljettu matka saadaan jännitepulsseista, jotka tuottaa matkamittariin asennettu anturi.

Tiedot ajasta, kuljetusta matkasta, kertyneistä polttoainepulsseista ja näppäimistöllä syötetyt koodit siirtyvät puskurimuistiin, joka tyhjentyy C-kasetille. Tältä kasetilta data siirretään myöhemmin tietokoneen muistiin, minkä jälkeen sitä voidaan käsitellä haluttujen tulosteiden saamiseksi.

2.2 Koejärjestelyt

Mittauspaikaksi valittiin kantatieltä nro 55 tieosalta 02 se 4800 metriä pitkä tieosuus, jolla on tehty vastaavat mittaukset edellisellä ajoanalysaattoriautolla. Koeosuus on Ab-päällystetty ja poikkileikkaukseltaan 10/7. Suuntaan 1 ajettaessa pituuskaltevuus vaihtelee -0,0215 - +0,0115 ja korkeusero alku- ja loppupään välillä on -31 m.

Tuulen voima ja suunta mitattiin n. 2 tunnin välein ja kullekin koepäivälle käytettiin saatujen havaintojen keskiarvoa. Rengaspaine vakioitiin 1,9 kp/cm^2, ja ajoja suoritettiin sekä 4- että 5-vaihteella. Nopeuksina käytettiin mittarinopeuksia 70, 80, 90 ja 100 km/h, ja nopeus pyrittiin pitämään mahdollisimman tasaisena läpi kunkin ajon aikana.

Matka-, aika-, nopeus- ja polttoaineenkulutushavainnot talletettiin ajoanalysaattorilla C-kaseteille. Nopeus-, polttoaineenkulutus- ja tuulihavainnot merkittiin myös lomakkeille.

Hyväksyttyjä edestakaisia ajoja tehtiin yhteensä 141.

3. MITTAUSTULOSTEN ANALYSOINTI REGRESSIOMALLEILLA

3.1 Yleistä

Havaintoaineistoon sovitettiin ensin ne mallit, joita oli käytetty muistiossa "Polttoaineen kulutusmallien estimointi testiaineistosta" (30.9.1984). Tämän lisäksi etsittiin uusia malleja askeltavalla regressioanalyysillä ja kokeiltiin havaintojen painottamisen vaikutusta selitysasteeseen.

Seuraavassa esitetään yksittäishavaintomallit suunnille 1 ja 2 sekä mallit edestakaisille ajoille. Vertailun vuoksi mukaan on otettu myös edellä mainitun muistion arvot vanhalle analysaattoriautolle. Uudelle autolle on laskettu mallit sekä 4- että 5-vaihteelle.

Analyysissä käytettiin seuraavia muuttujia:

1	K	polttoaineenkulutus	1/100 km
2	V	nopeus	m/s
3	1/v	nopeuden käänteisluku	s/m
4	V^2	nopeuden neliö	m^2/s^2
5	W_1	ajoradan suuntainen tuuli	m/s
6	$(V-W_1)^2$	suhteellisen vastatuulen neliö	m^2/s^2
7	W_2	sivutuuli	m/s
8	W_2^2	sivutuulen neliö	m^2/s^2

Muut merkinnät:

n	havaintojen lukumäärä
4	4-vaihteella tehdyt ajot
5	5-vaihteella tehdyt ajot
-85	uuden analysaattoriauton mallit
-84	vanhan analysaattoriauton mallit

3.2 Yksittäishavainnot

(1) $K = A + B1/v + C(V-W_1)^2$ /Liitteet 1A, 2A, 3A ja 4A/

Suunta 1

	-85				-84	
	4	t	5	t		t
A	5,50	7,60	4,54	10,4	4,696	22,81
B	-13,7	-1,27	-1,63	-0,25	-12,54	-3,89
C	0,0040	7,95	0,0032	10,6	0,003274	24,61
r^2	0,931		0,861		0,892	
n	39		102		223	

Suunta 2

	-85				-84	
	4	t	5	t		t
A	5,63	6,34	3,00	6,22	5,971	25,4
B	4,06	0,32	37,7	5,29	-8,122	-2,20
C	0,0042	6,87	0,0048	14,8	0,00294	19,76
r^2	0,867		0,840		0,822	
n	39		102		224	

B:n merkitsevyys suunnassa 1 ja 4-vaihteella myös suunnassa 2 jäi nyt olemattomaksi. Kuitenkin nyt päästiin korkeampiin selitysasteisiin kuin -84 lukuunottamatta 5-vaihteen mallia suunnassa 1.

(2) $K = A + B1/v + C(V-W_1)^2 + Dv$ /Liitteet 1A, 2A, 3A ja 4A/

Suunta 1

	-85				-84	
	4	t	5	t		t
A	-5,49	-1,46	0,482	0,192	1,44	0,808
B	99,0	2,52	40,4	1,53	20,74	1,13
C	0,0034	6,92	0,0030	9,45	0,0032	24,0
D	0,276	2,96	0,100	1,64	0,0789	1,84
r^2	0,945		0,865		0,894	
n	39		102		223	

Suunta 2

	-85				-84	
	4	t	5	t		t
A	-1,41	-0,278	4,44	1,48	0,1252	0,06
B	76,5	1,45	22,8	0,723	51,51	2,40
C	0,0040	6,28	0,0049	14,2	0,0029	19,1
D	0,174	1,41	-0,0353	-0,484	0,1422	2,82
r^2	0,874		0,840		0,828	
n	39		102		224	

Mallissa (2) kertoimien B (1/v) ja D (v) tilastollinen merkitsevyys jäi heikoksi paitsi 4-vaihteella 1-suuntaan. $C[(V-W_1)^2]$ on ylivoimaisesti paras näistä muuttujista.

(3) $K = A + Dv + C(V-W_1)^2$ /Liitteet 1B, 2B, 3B ja 4B/

Suunta 1

	-85				-84	
	4	t	5	t		t
A	3,97	12,2	4,31	21,5	3,448	28,9
D	0,0483	1,96	0,0096	0,642	0,0312	4,17
C	0,0037	6,96	0,0031	9,66	0,0032	24,0
r^2	0,935		0,862		0,893	
n	39		102		223	

Suunta 2

	-85				-84	
	4	t	5	t		t
A	5,90	15,5	6,61	30,2	5,122	36,9
D	0,0008	0,026	-0,0867	-5,26	0,0229	2,65
C	0,0040	6,30	0,0049	14,4	0,0029	19,1
r^2	0,866		0,839		0,823	
n	39		102		224	

Nopeuden kertoimella D on tilastollista merkitsevyyttä vain suunnassa 2 5-vaihteelle muodostetussa mallissa. Tällöinkin sen etumerkki on teorian vastainen.

Muistion 30.9.1984 tuloksiin verrattuna nyt saavutettiin mallista riippuen 1-5 % korkeammat selitysasteet lukuunottamatta 5-vaihteen malleja suunnassa 1, joissa aikaisemmista tuloksista jäätiin n. 3 %.

Sivutuulen ottaminen mukaan malleihin paransi -84 2-suunnan selitysastetta n. 3 %, mutta ei merkittävästi suunnassa 1.
Näin kävi nytkin (mallit (4) - (6)).

(4) $K = A + Dv + C(V-W_1)^2 + EW_2$ /Liitteet 1B, 2B, 3B ja 4B/

Suunta 1

	-85				-84	
	4	t	5	t		t
A	4,32	11,4	4,51	18,2	-	-
D	0,0080	0,234	-0,012	-0,541	-	-
C	0,0046	5,97	0,0036	7,24	-	-
E	0,231	1,67	0,113	1,32	-	-
r^2	0,940		0,864		-	
n	39		102		-	

Suunta 2

	-85				-84	
	4	t	5	t		t
A	6,94	13,7	7,49	25,2	4,998	-
D	-0,0827	-2,05	-0,158	-6,78	0,0269	-
C	0,0059	6,66	0,0065	12,8	0,0028	-
E	-0,475	-2,83	-0,385	-4,06	0,0174	-
r^2	0,891		0,863		0,852	
n	39		102		-	

(5) $K = A + B1/v + C(V-W_1)^2 + EW^2$ /Liitteet 1C, 2C, 3C ja 4C/

Suunta 1

	-85				-84	
	4	t	5	t		t
A	3,89	3,96	3,79	6,01	4,71	22,6
B	7,24	0,530	8,35	0,944	-12,7	-3,91
C	0,0051	7,51	0,0037	8,58	0,0033	24,4
E	0,300	2,29	0,129	1,65	-0,0011	-0,462
r^2	0,940		0,865		0,892	
n	39		102		223	

Suunta 2

	-85				-84	
	4	t	5	t		t
A	3,44	3,18	1,33	2,04	6,016	27,8
B	36,7	2,31	62,5	6,45	-9,862	-2,90
C	0,0059	7,52	0,0061	12,9	0,0028	20,6
E	-0,46	-3,02	-0,35	-3,56	0,0175	6,46
r^2	0,894		0,858		0,850	
n	39		102		224	

(6) $K = A + B1/v + Dv + C(V-W_1)^2 + EW^2$ /Liitteet 1C, 2C, 3C ja 4C/

Suunta 1

	-85				-84	
	4	t	5	t		t
A	-4,63	-1,24	1,14	0,441	-	-
B	93,1	2,41	35,2	1,31	-	-
D	0,227	2,35	0,0708	1,06	-	-
C	0,0043	5,80	0,0034	6,80	-	-
E	0,200	1,53	0,0918	1,06	-	
r^2	0,948		0,867		-	
n	39		102		-	

Suunta 2

	-85				-84	
	4	t	5	t		t
A	1,87	0,385	6,32	2,22	0,1732	0,09
B	52,3	1,05	12,2	0,414	49,74	2,53
D	0,0414	0,331	-0,130	-1,80	0,1422	3,08
C	0,0058	6,36	0,0065	12,5	0,0028	19,98
E	-0,441	-2,58	-0,381	-3,99	0,0175	6,58
r^2	0,895		0,863		0,856	
n	39		102		224	

Suunnassa 2 sivutuulen neliön kerroin E poikkeaa tilastollisesti merkitsevästi nollasta, mutta sen merkki on väärä. Varsinkin mallissa (6) kertoimien A, B ja D merkitsevyys putoaa, kun E otetaan mukaan.

Askeltavalla regressioanalyysillä haettiin uudet mallit eri tapauksille. Lähtöjoukkoon kuuluivat kaikki mahdolliset muuttujat: V, 1/v, V^2, W_1, $(V-W_1)^2$, W_2 ja W^2.
Menetelmä antoi seuraavat mallit:

Suunta 1, 4-vaihde /Liite 1E/

$K = 4,40 + 0,005\ (V-W_1)^2 + 0,253W^2$ (A1)

$r^2 = 0,940$

t-arvot 38,4, 22,9 ja 2,63

Suunta 1, 5-vaihde /Liite 2E/

$K = 4,36 + 0,003\ (V-W_1)^2 + 0,097W_2$ (A2)

$r^2 = 0,866$

t-arvot 57,9, 24,9 ja 1,82

Näillä päästään suunnilleen samaan selitysasteeseen kuin -84-tyyppisillä malleilla, mutta vähemmillä muuttujilla.

Suunta 2, 4-vaihde /Liite 3E/

$K = 6,12 + 0,004\ (V-W_1)^2 - 1,22W_2 + 1,02\ W^2$ (A3)

$r^2 = 0,917$

t-arvot 52,7, 19,0, -4,05 ja 3,16

Suunta 2, 5-vaihde /Liitteet 4E - F/

$K = 3,03 + 39,8\ 1/v + 0,005\ \ (V-W_1)^2 - 0,864W_2 + 0,705\ W^2$ (A4)

$r^2 = 0,880$

t-arvot 4,15, 9,57, 3,78, -4,16 ja 2,69

2-suunnassa tällä tavoin saadut mallit antoivat n. 2 % korkeamman selitysasteen kuin vanhat mallit.
Malleja (A2) ja (A3) sovellettiin kaikkiin tapauksiin:

(A2) $K = A + C(V-W_1)^2 + FW_2$ /Liitteet 6A, 2E, 6C ja 6D/

	Suunta 1				Suunta 2			
	4	t	5	t	4	t	5	t
A	4,39	37,6	4,36	57,9	5,99	49,4	5,53	64,3
C	0,0048	23,3	0,003	24,9	0,0042	17,3	0,0033	18,9
F	0,231	2,62	0,097	1,82	-0,313	-3,01	-0,035	-0,492
r^2	0,939		0,866		0,893		0,795	
n	39		102		39		102	

Tämä malli antaa 2-suunnassa väärän etumerkin sivutuulen kertoimelle F, ja 5-vaihteella myös selitysaste jää huonoksi. Suunnalle 1 malli on käyttökelpoinen.

(A3) $K = A + C(V-W_1)^2 + FW_2 + EW^2$ /Liitteet 6A, 6B, 3E ja 6D/

	Suunta 1				Suunta 2			
	4	t	5	t	4	t	5	t
A	4,39	37,2	4,36	57,9	6,12	52,7	5,78	72,9
C	0,0048	22,1	0,0033	23,8	0,004	19,0	0,0030	20,5
F	0,111	0,381	0,286	1,64	-1,22	-4,05	-1,27	-6,73
E	0,138	0,434	-0,211	-1,14	1,02	3,16	1,39	6,88
r^2	0,940		0,868		0,917		0,862	
n	39		102		39		102	

Mallia vaivaavat kuitenkin sivutuulen ja sen neliön negatiiviset kertoimet (F ja E). 1-suunnassa 4-vaihteella tätä haittaa ei ole, mutta selitysaste ei myöskään ole erityisen hyvä.

Sivutuulen neliön vaihtaminen sen neljänteen potenssiin ei parantanut yksittäishavaintomallien selitysasteita /Liitteet 5A - B/.
Residuaaleja tarkasteltaessa hajonta näytti pienenevän nopeuden kasvaessa. Tämän vuoksi kokeiltiin myös havaintojen painottamista nopeuden mukaan. Tällöin selitysasteet kuitenkin putosivat enimmillään lähes 40 %. Esimerkkinä malli (2) painotettuna:

(2P) $K = A + B1/v + C(V-W_1)^2 + Dv$ /Liitteet 1D ja 2D/

	Suunta 1, 4-vaihde				Suunta 1, 5-vaihde			
	painotettu	t	painottamaton	t	painotettu	t	painottamaton	t
A	-5,28	-1,46	-5,49	-1,46	0,294	0,116	0,482	0,192
B	96,7	2,57	99,0	2,52	42,3	1,60	40,4	1,53
C	0,0034	7,19	0,0034	6,92	0,0030	9,23	0,0030	9,45
D	0,271	3,02	0,276	2,96	0,105	1,70	0,100	1,64
r^2	0,743		0,945		0,496		0,865	
n	39		39		102		102	

3.3 Edestakaiset ajot

Mallit (8) - (11) ovat samoja, joita käytettiin jo -84.

(8) $K = A + B1/v + Cv^2$ /Liitteet 7A ja 8A/

	-85				-84	
	4	t	5	t		t
A	1,28	0,985	3,05	3,31	2,8716	4,83
B	54,9	3,01	28,4	2,19	23,76	2,90
C	0,0072	7,70	0,0045	6,91	0,005	11,2
r^2	0,963		0,902		0,904	
n	39		102		260	

(9) $K = A + Dv + Cv^2$ /Liitteet 7A ja 8A/

	-85				-84	
	4	t	5	t		t
A	9,06	7,09	7,05	7,69	6,287	10,6
D	-0,364	-3,03	-0,186	-2,18	-0,1618	-2,86
C	0,0129	4,62	0,0074	3,76	0,0075	5,65
r^2	0,963		0,902		0,904	
n	39		102		260	

Nämä mallit ovat yksinkertaisia ja selitysasteeltaan korkeita. Tuulesta otetaan mukaan sivutuulikomponentti:

(10) $K = A + B1/v + Cv^2 + EW_1^2$ /Liitteet 7B ja 8B/

	-85				-84	
	4	t	5	t		t
A	1,26	0,955	3,07	3,43	2,875	4,99
B	55,1	2,97	27,5	2,18	23,27	2,93
C	0,0073	7,58	0,0045	7,03	0,0049	11,5
E	0,0096	0,152	0,0991	2,57	0,0071	4,25
r^2	0,963		0,908		0,911	
n	39		102		260	

(11) $K = A + Dv + Cv^2 + EW_2^2$ /Liitteet 7B ja 8B/

	-85				-84	
	4	t	5	t		t
A	9,07	6,99	6,95	7,79	6,223	10,8
D	-0,365	-2,99	-0,181	-2,17	-0,1588	-2,90
C	0,0129	4,56	0,0073	3,80	0,0074	5,78
E	0,0098	0,156	0,0992	2,57	0,0071	4,25
r^2	0,963		0,908		0,910	
n	39		102		260	

4-vaihteella sivutuulen neliö ei vaikuttanut mallin selitysasteeseen, mutta 5-vaihteella se on hyvä selittäjä.

Askeltavalla regressioanalyysillä 4-vaihteelle saatiin malli (9), mutta 5-vaihteelle menetelmä antoi muuttujavalikoiman:

(A5) $K = 3,19 + 26,9\ 1/v + 0,004V^2 - 0,505W_2 + 0,603W^2$

$r^2 = 0,924$

t-arvot 3,90, 2,32, 7,65, -4,51 ja 5,14 /Liitteet 8C - D/

Painotettuja malleja ei edestakaisiin ajoihin kokeiltu. Sivutuulen neljäs potenssi käytettynä sen neliön tilalla paransi 5-vaihteelle tehtyjen mallien selitysastetta vajaalla prosentilla. /Liitteet 7E ja 8F/

4. JOHTOPÄÄTÖKSET

4.1 Vanhan ja uuden analysaattoriauton vertailu

Tasaisella nopeudella vanhan ja uuden analysaattoriauton polttoaineenkulutusero riippuu selvästi siitä, käytetäänkö uudessa autossa 4- vai 5-vaihdetta. Valmistaja suosittelee käytettäväksi 5:sta 70 km/h ylöspäin, käytännössä useimmat kuljettajat vaihtavat 5:lle jo 60 km/h nopeudessa, kun ajetaan tasaisella nopeudella.

Kulutuseroja (uuden auton kulutus 4- tai 5-vaihteella - vanhan auton kulutus) kuvaavat seuraavat mallit, jotka on saatu vähentämällä ao. uuden auton mallista vastaava vanhan auton malli:

(Δ9) $\Delta K_4 = 2,777 - 0,2022V + 0,0054V^2$

(Δ8) $\Delta K_5 = 0,176 + 4,641/v - 0,0005V^2$

4-vaihteella autojen polttoaineenkulutusero vaihtelee n. 0,9 - 1,3 l/100 km, kun nopeus vaihtelee 60 - 100 km/h. Vastaavasti 5-vaihteella ero on n. 0,3 l/100 km nopeudella 60 km/h, mutta 100 km/h nopeudella uusi auto on jopa hieman vanhaa taloudellisempi.

Nämä tulokset kuvaavat autojen eroja: uudessa autossa suuremman ja tehokkaamman moottorin aiheuttamaa kulutuksen kasvua on kompensoitu 5:nnellä vaihteella, mutta kokonaisvälityssuhde ei ole kasvanut kovin paljon.

4.2 Tulosten arviointia

1984 saatuihin tuloksiin verrattuna voidaan todeta, että yksittäishavaintomalleissa päästiin tällä kertaa korkeampiin selitysasteisiin lukuunottamatta malleja 1-suunnassa 5-vaihteella tehdyille ajoille. Edestakaisilla ajoilla 5-vaihteelle tehtyjen mallien selitysaste oli käytännöllisesti katsoen sama kuin -84 malleilla, mutta 4-vaihteella selvästi korkeampi.

Ilmeisesti syksyllä -85 tutkimuspäivinä vallinneet tasaiset, heikohkot tuulet pitivät hajonnan pienenä, sillä muuten koejärjestelyt poikkesivat epäedulliseen suuntaan muistion 30.9.1984 tapaukseen verrattuna: Tällä kertaa hyväksyttyjä edestakaisia ajoja tehtiin 141, viimeksi 260. Nyt käytettiin jokaiselle päivälle sen keskimääräistä tuulta, viimeksi pyrittiin interpoloimaan jokaiselle havainnolle omat tuulikomponentit. Lisäksi nyt otos jaettiin vielä 4- ja 5-vaihteella tehtyihin ajoihin.

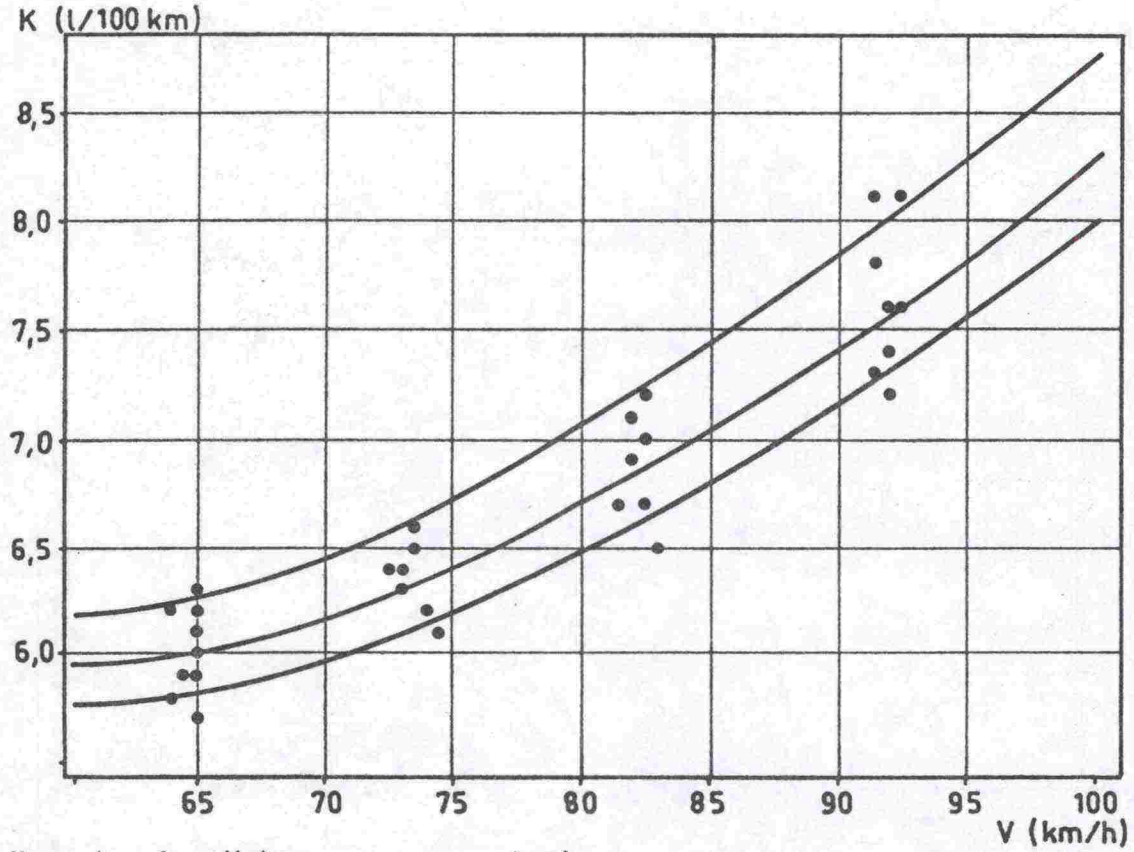
Tämänkertaisten mittausten aikana vain yhtenä koepäivänä tuulen nopeus ylitti 2 m/s. Siksi -84 muistiossa mainittua 2 m/s maksimituulta lienee syytä noudattaa aikaisempaa tarkemmin uusia malleja käytettäessä.

5-vaihteelle tehtyjen mallien selitysaste jäi säännöllisesti heikommaksi kuin vastaavien 4-vaihteen mallien. Todennäköisesti raskas pitkä välityssuhde korostaa puuskien, vastaantulevien ajoneuvojen aiheuttamien paineaaltojen ym. kontrolloimattomien muuttujien vaikutusta.

Vanhalla ja uudella autolla tehtyjä ajoanalysaattorimittauksia vertailtaessa voitaneen 4-vaihteen kulutuseromallia ($\Delta 9$) käyttää kaupunkiajoissa ja 5-vaihteen mallia ($\Delta 8$) maantiellä.

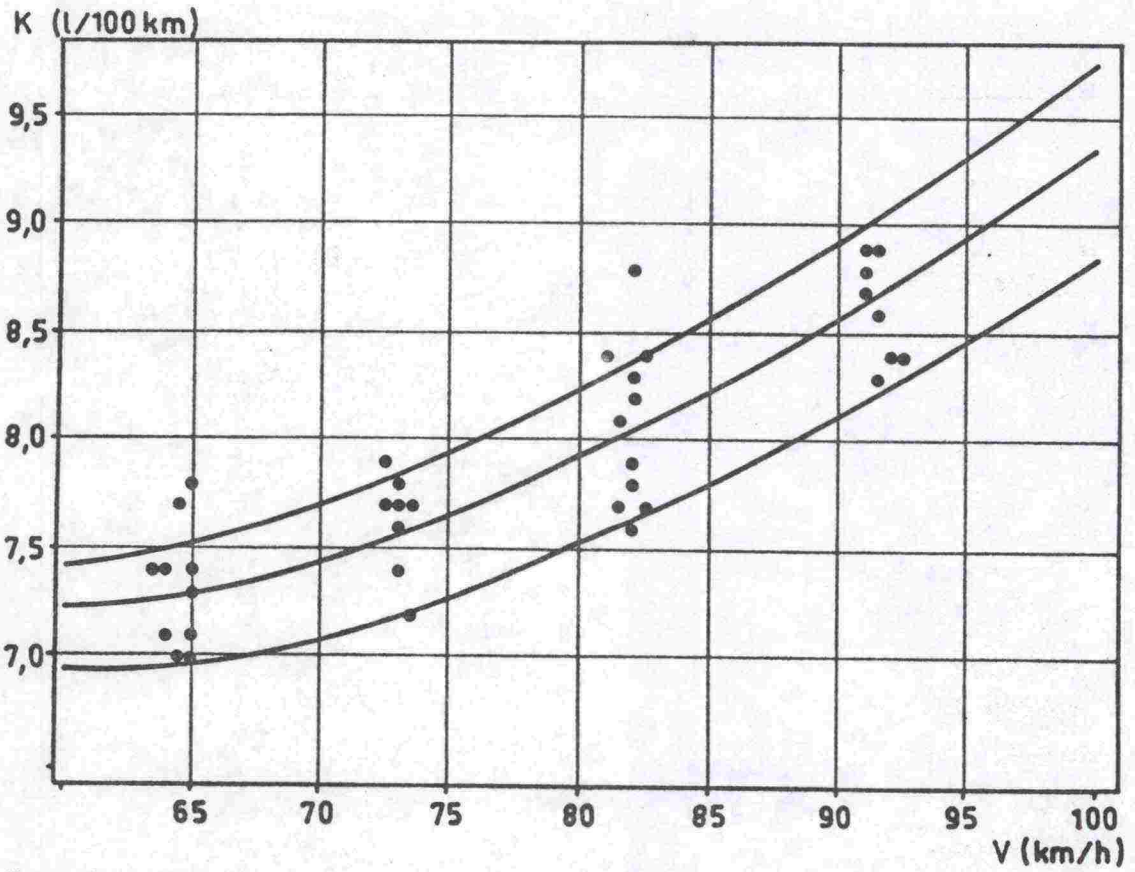
4.3 Kuvaajat

Esitykseen on otettu seuraavat kuvaajat:
Suuntiin 1 ja 2 sekä vaihteella 4 että 5 mallin (2) kuvaajat kokeiden aikana vallinneissa keskimääräisissä tuulioloissa ja 2 m/s vasta- ja myötätuulessa.
Edestakaisten ajojen käyrät 4-vaihteelle malli (8) ja 5-vaihteelle malli (9) 95 % luottamusväleineen. Näissä kuvissa on myös vanhan analysaattoriauton 4-vaihteen kulutuskäyrät vertailun vuoksi.



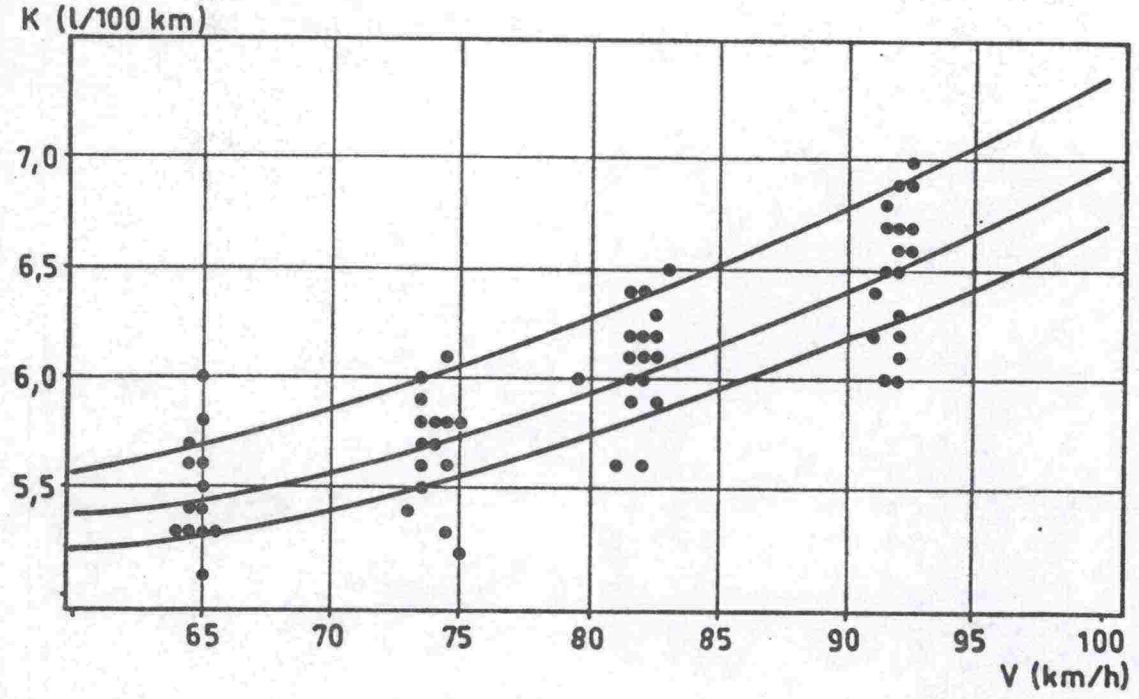
Kuva 1. 4-vaihde suunta 1

$$K = -5{,}49 + 99{,}0\ 1/v + 0{,}0034(V-W_1)^2 + 0{,}276\ v \qquad (2)$$



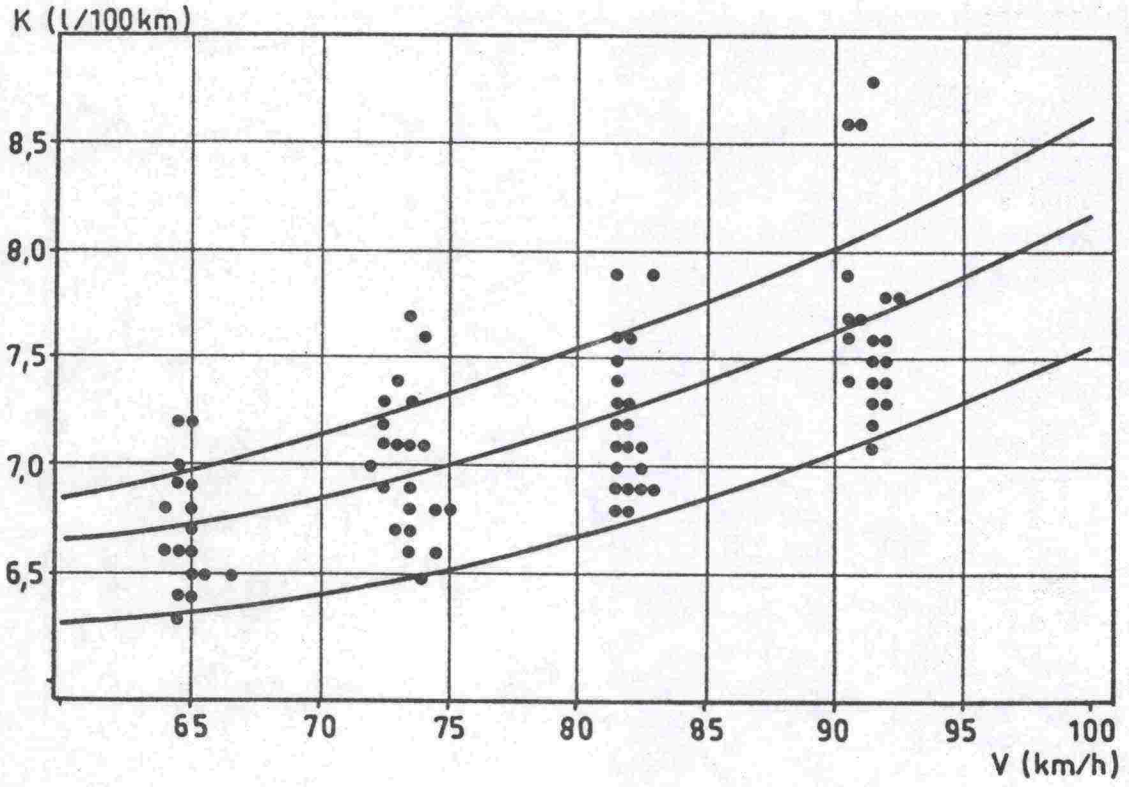
Kuva 2. 4-vaihde suunta 2

$$K = -1{,}41 + 76{,}5\ 1/v + 0{,}0040(V-W_1)^2 + 0{,}174\ v \qquad (2)$$



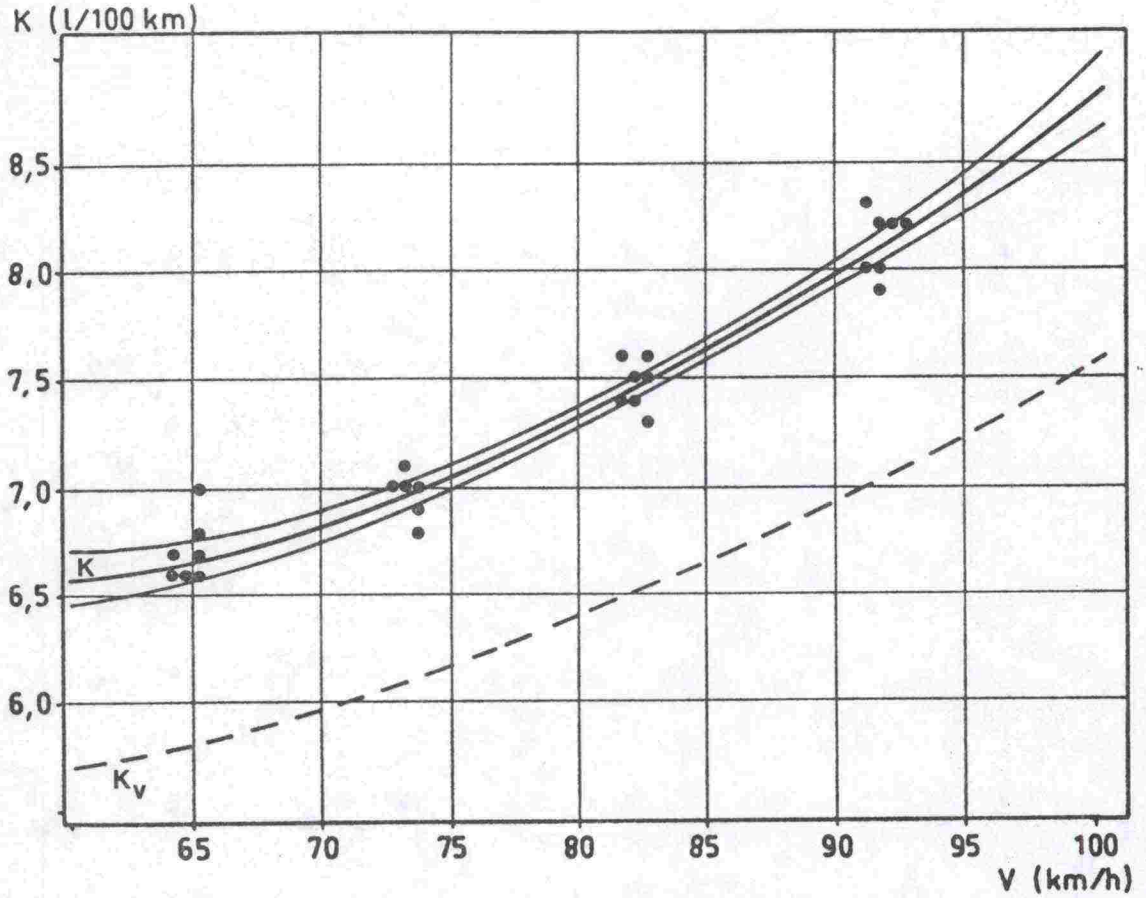
Kuva 3. 5-vaihde suunta 1

$$K = 0{,}482 + 40{,}4\ 1/v + 0{,}0030(V-W_1)^2 + 0{,}100\ v \qquad (2)$$



Kuva 4. 5-vaihde suunta 2

$$K = 4{,}44 + 22{,}8\ 1/v + 0{,}0049(V-W_1)^2 - 0{,}0353\ v \qquad (2)$$

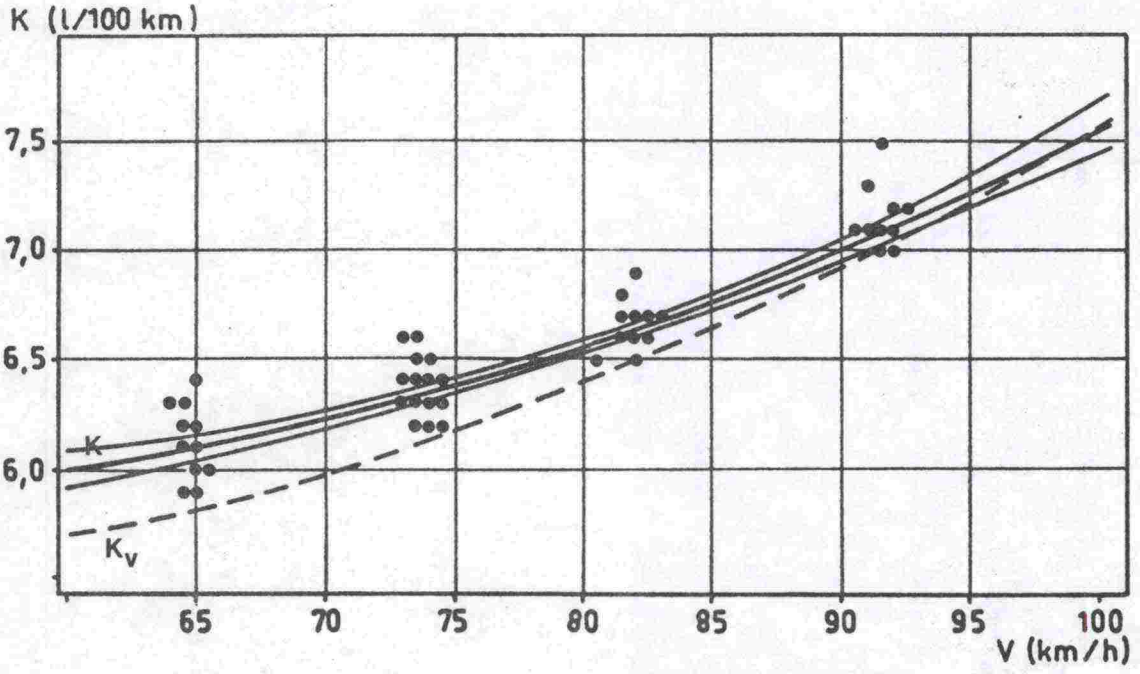


Kuva 5. 4-vaihde edestakaiset ajot

$K = 1{,}28 + 54{,}9\ 1/v + 0{,}0072\ v^2$ (8)

95 % luottamusväleineen

Vanhan Talbotin $K_v = 2{,}87 + 23{,}8\ 1/v + 0{,}005\ v^2$



Kuva 6. 5-vaihde edestakaiset ajot

$K = 7{,}05 - 0{,}186\ v + 0{,}0074\ v^2$ (9)

95 % luottamusväleineen

Vanhan Talbotin $K_v = 6{,}29 - 0{,}162\ v + 0{,}0075\ v^2$

1 2 3 4 5 6 7 8

```
      V4S1
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2  W2      W2**2
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	5.4953	.7234	7.5968	4.0279	6.9627
B1	-13.6706	10.7249	-1.2747	-35.4267	8.0856
B2	.0040	.0005	7.9542	.0030	.0050

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	13.80596	2	6.90298	242.842
RESIDUAL	1.02333	36	.02843	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .965
R SQUARED FACTOR                 =     .931
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	-5.4918	3.7649	-1.4587	-13.1367	2.1531
B1	98.9547	39.2269	2.5226	19.3013	178.6080
B2	.0034	.0005	6.9162	.0024	.0045
B3	.2756	.0930	2.9636	.0868	.4644

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	14.01125	3	4.67042	199.824
RESIDUAL	.81804	35	.02337	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .972
R SQUARED FACTOR                 =     .945
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.9748	.3249	12.2357	3.3158	4.6337
B1	.0483	.0247	1.9559	-.0018	.0985
B2	.0037	.0005	6.9568	.0026	.0047

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	13.86251	2	6.93126	258.100
RESIDUAL	.96678	36	.02685	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .967
R SQUARED FACTOR                 =     .935
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	4.3186	.3784	11.4143	3.5504	5.0869
B1	.0080	.0342	.2337	-.0614	.0774
B2	.0046	.0008	5.9692	.0031	.0062
B3	.2306	.1384	1.6663	-.0504	.5116

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	13.93357	3	4.64452	181.483
RESIDUAL	.89572	35	.02559	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .969
R SQUARED FACTOR                 =     .940
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	3.8863	.9807	3.9629	1.8950	5.8776
B1	7.2378	13.6470	.5304	-20.4736	34.9492
B2	.0051	.0007	7.5062	.0038	.0065
B3	.3000	.1310	2.2902	.0340	.5659

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	13.93933	3	4.64644	182.732
RESIDUAL	.88997	35	.02543	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .970
R SQUARED FACTOR                 =     .940
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	-4.6339	3.7371	-1.2400	-12.2304	2.9627
B1	93.0967	38.6868	2.4064	14.4573	171.7360
B2	.2272	.0966	2.3527	.0309	.4235
B3	.0043	.0007	5.8037	.0028	.0058
B4	.1995	.1304	1.5298	-.0656	.4646

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 34 DF = 2.033

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	14.06393	4	3.51598	156.191
RESIDUAL	.76536	34	.02251	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .974
R SQUARED FACTOR                 =     .948
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      ⎕IO[1]←1
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT        ** 1
ENTER WEIGHT VECTOR OR MATRIX  ** M[;2] PAINOTETTU VILLA
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	¯5.2828	3.6290	¯1.4557	¯12.6518	2.0862
B1	96.6818	37.6310	2.5692	20.2691	173.0945
B2	.0034	.0005	7.1901	.0025	.0044
B3	.2712	.0899	3.0161	.0886	.4537

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	.07330	38	.00193	
REGRESSION (CORRECTED)	.05444	3	.01815	33.661
RESIDUAL	.01887	35	.00054	
CORRECTION FACTOR	43.80095	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .862
R SQUARED FACTOR                 =     .743
THE SIGNIFICANCE OF REGRESSION   = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

THE TRANSFORMATION MATRIX (VECTOR) IS NAMED B
```

```
      )COPY 42 STAT7A
SAVED 17:04:50 11/16/80
      ,1 STEP M
STEPWISE REGRESSION

NUMBER  OF VARIABLES IS: 7
NUMBER OF  RESPONSES IS: 39
F-LEVEL FOR ENTERING IS: 0.1
F-LEVEL FOR  LEAVING IS: 0.1
MAXIMUM NO. OF STEPS IS: 7

STEP 1
ENTERING VARIABLE IS: 5. RESIDUAL VARIANCE IS: 0.02891
COMPUTED F IS       :  476.021 WITH DF: 1 37
COMPUTED F LEVEL IS :  .000

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      4.582          .099      46.095    2124.715
  5            .005          .000      21.818     476.021
NO VARIABLE IS DROPPED.

STEP 2
ENTERING VARIABLE IS: 7. RESIDUAL VARIANCE IS: 0.02492
COMPUTED F IS       :    6.918 WITH DF: 1 36
COMPUTED F LEVEL IS :  .012

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      4.403          .115      38.386    1473.458
  5            .005          .000      22.929     525.746
  7            .253          .096       2.630       6.918
NO VARIABLE IS DROPPED.

STEP 3

SEARCH ENDS, FINAL COMPUTED F LEVEL TO ENTER:  .508
FINAL REJECTED CANDIDATE IS 7 WITH COMPUTED F=    6.918 AND DF= 1 35

FINAL SET:  5  7

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      4.403          .115      38.386    1473.458
  5 (v-w1)2    .005          .000      22.929     525.746
  7 w2         .253          .096       2.630       6.918


                REGRESSION ANALYSIS TABLE

   SOURCE                    SS          DF        MS          F
TOTAL (CORRECTED)          14.82929      38        .39024
REGRESSION (CORRECTED)     13.93217       2       6.96609    279.538
RESIDUAL                     .89712      36        .02492

CORRECTION FACTOR        1733.86671       1

MULTIPLE CORRELATION COEFFICIENT =     .969
R SQUARED FACTOR                 =     .940
THE SIGNIFICANCE OF REGRESSION   =  1.00000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)
```

```
      )OSI
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2  W2      W2**2
      REGGY .05
SYNTAX ERROR
      $RREGGY .05
               ^
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	4.5434	.4362	10.4151	3.6776	5.4092
B1	¯1.6287	6.5071	¯.2503	¯14.5431	11.2857
B2	.0032	.0003	10.5764	.0026	.0038

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.00509	2	9.00254	307.799
RESIDUAL	2.89557	99	.02925	
CORRECTION FACTOR	3603.79965	1		

MULTIPLE CORRELATION COEFFICIENT = .928
R SQUARED FACTOR = .861
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	¯¯(.4821	2.5101	.1920	¯4.5003	5.4644
B1	40.4250	26.4030	1.5311	¯11.9826	92.8327
B2	.0030	.0003	9.4548	.0024	.0037
B3	.1003	.0610	1.6426	¯.0209	.2214

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.08267	3	6.02756	209.618
RESIDUAL	2.81799	98	.02875	
CORRECTION FACTOR	3603.79965	1		

MULTIPLE CORRELATION COEFFICIENT = .930
R SQUARED FACTOR = .865
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	4.3131	.2006	21.4977	3.9149	4.7113
B1	.0096	.0150	.6418	¯.0202	.0394
B2	.0031	.0003	9.6605	.0025	.0037

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.01526	2	9.00763	309.059
RESIDUAL	2.88539	99	.02915	
CORRECTION FACTOR	3603.79965	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .928
R SQUARED FACTOR                 =     .862
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	4.5075	.2480	18.1734	4.0152	4.9999
B1	¯.0120	.0222	¯.5412	¯.0560	.0320
B2	.0036	.0005	7.2446	.0026	.0046
B3	.1126	.0851	1.3238	¯.0562	.2814

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.06595	3	6.02198	208.189
RESIDUAL	2.83471	98	.02893	
CORRECTION FACTOR	3603.79965	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .930
R SQUARED FACTOR                 =     .864
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.7893	.6298	6.0164	2.5392	5.0395
B1	8.3549	8.8522	.9438	-9.2159	25.9257
B2	.0037	.0004	8.5832	.0029	.0046
B3	.1294	.0786	1.6471	-.0265	.2854

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.08309	3	6.02770	209.654
RESIDUAL	2.81757	98	.02875	
CORRECTION FACTOR	3603.79965	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .930
R SQUARED FACTOR                 =     .865
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** OK0
INPUT THE DEGREE OF FIT        ** 0
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	1.1398	2.5834	.4412	-3.9887	6.2684
B1	35.1567	26.8454	1.3096	-18.1360	88.4494
B2	.0708	.0670	1.0574	-.0621	.2038
B3	.0034	.0005	6.8009	.0024	.0045
B4	.0918	.0862	1.0643	-.0794	.2629

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 97 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.11520	4	4.52880	157.710
RESIDUAL	2.78546	97	.02872	
CORRECTION FACTOR	3603.79965	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .931
R SQUARED FACTOR                 =     .867
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      □←I[1]+1
      REGGT .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT        ** 1
ENTER WEIGHT VECTOR OR MATRIX  ** M[;2]   PAINOTETTU VILLA
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0

                COEFFICIENT                B/SIGMA(B)      CONFIDENCE INTERVAL
TERM                  B          SIGMA(B)       T          LOWER        UPPER
B0                 .2938          2.5327       .1160      ¯4.7335       5.3210
B1               42.3224         26.4903      1.5977     ¯10.2585      94.9033
B2                 .0030          .0003      9.2262        .0024        .0037
B3                 .1053          .0619      1.6997       ¯.0177        .2282
 THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF =    1.985

                    REGRESSION ANALYSIS TABLE

   SOURCE                    SS          DF          MS          F
TOTAL (CORRECTED)          .05491         101       .00054
REGRESSION (CORRECTED)     .02726           3       .00909     32.192
RESIDUAL                   .02766          98       .00028
CORRECTION FACTOR        34.90210           1

MULTIPLE CORRELATION COEFFICIENT =     .705
R SQUARED FACTOR                 =     .496
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

THE TRANSFORMATION MATRIX (VECTOR) IS NAMED □
```

)COPY 42 STA
SAVED 17:04:50 11/16/80

LIITE 2E

```
      .1 STEP M
STEPWISE REGRESSION

NUMBER  OF VARIABLES IS: 7
NUMBER OF  RESPONSES IS: 102
F-LEVEL FOR ENTERING IS: 0.1
F-LEVEL FOR  LEAVING IS: 0.1
MAXIMUM NO. OF STEPS IS: 7

STEP 1
ENTERING VARIABLE IS: 5. RESIDUAL VARIANCE IS: 0.02897
COMPUTED F IS        :  621.359 WITH DF: 1 100
COMPUTED F LEVEL IS  :  .000

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      4.435          .063      70.599    4984.244
  5           .003           .000      24.927     621.359
NO VARIABLE IS DROPPED.

STEP 2
ENTERING VARIABLE IS: 6. RESIDUAL VARIANCE IS: 0.02832
COMPUTED F IS        :    3.309 WITH DF: 1 99
COMPUTED F LEVEL IS  :  .068

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      4.358          .075      57.869    3348.821
  5           .003           .000      24.890     619.497
  6           .097           .053       1.819       3.309
NO VARIABLE IS DROPPED.

STEP 3

SEARCH ENDS, FINAL COMPUTED F LEVEL TO ENTER:  .257
FINAL REJECTED CANDIDATE IS 6 WITH COMPUTED F=    3.309 AND DF= 1 98

FINAL SET:  5  6

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      4.358          .075      57.869    3348.821
  5 (v-w1)^2  .003           .000      24.890     619.497
  6 w2        .097           .053       1.819       3.309


                REGRESSION ANALYSIS TABLE

   SOURCE                    SS          DF        MS          F
TOTAL (CORRECTED)          20.90065      101       .20694
REGRESSION (CORRECTED)     18.09696        2      9.04848    319.507
RESIDUAL                    2.80369       99       .02832

CORRECTION FACTOR        3603.79965        1

MULTIPLE CORRELATION COEFFICIENT =      .931
R SQUARED FACTOR                 =      .866
THE SIGNIFICANCE OF REGRESSION   =  1.00000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)
```

```
      V4S2
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2  W2      W2**2
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6]
 INPUT THE DEGREE OF FIT         ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	5.6289	.8882	6.3375	3.8272	7.4307
B1	4.0553	12.8280	.3161	¯21.9670	30.0777
B2	.0042	.0006	6.8730	.0030	.0055

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.41856	2	5.20928	117.016
RESIDUAL	1.60263	36	.04452	
CORRECTION FACTOR	2409.09001	1		

MULTIPLE CORRELATION COEFFICIENT = .931
R SQUARED FACTOR = .867
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** (-0)(-

      )IREGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT         ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	¯1.4082	5.0620	¯.2782	¯11.6869	8.8705
B1	76.5215	52.8764	1.4472	¯30.8482	183.8911
B2	.0040	.0006	6.2791	.0027	.0053
B3	.1737	.1231	1.4115	¯.0762	.4236

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.50487	3	3.50162	80.825
RESIDUAL	1.51632	35	.04332	
CORRECTION FACTOR	2409.09001	1		

MULTIPLE CORRELATION COEFFICIENT = .935
R SQUARED FACTOR = .874
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	5.8972	.3809	15.4821	5.1245	6.6699
B1	.0008	.0299	.0263	¯.0599	.0614
B2	.0040	.0006	6.2987	.0027	.0053

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.41414	2	5.20707	116.645
RESIDUAL	1.60705	36	.04464	
CORRECTION FACTOR	2409.09001	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .931
R SQUARED FACTOR                 =     .866
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	6.9405	.5078	13.6681	5.9094	7.9716
B1	¯.0827	.0403	¯2.0535	¯.1645	¯.0009
B2	.0059	.0009	6.6621	.0041	.0077
B3	¯.4748	.1681	¯2.8255	¯.8161	¯.1336

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.71263	3	3.57088	95.510
RESIDUAL	1.30856	35	.03739	
CORRECTION FACTOR	2409.09001	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .944
R SQUARED FACTOR                 =     .891
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.4420	1.0812	3.1834	1.2464	5.6375
B1	36.6530	15.8428	2.3135	4.4828	68.8232
B2	.0059	.0008	7.5238	.0043	.0075
B3	-.4644	.1539	-3.0177	-.7769	-.1519

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.74945	3	3.58315	98.613
RESIDUAL	1.27174	35	.03634	
CORRECTION FACTOR	2409.09001	1		

MULTIPLE CORRELATION COEFFICIENT = .946
R SQUARED FACTOR = .894
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	1.8720	4.8646	.3848	-8.0164	11.7605
B1	52.3172	49.9397	1.0476	-49.1961	153.8305
B2	.0414	.1251	.3312	-.2129	.2958
B3	.0058	.0009	6.3588	.0039	.0076
B4	-.4412	.1709	-2.5826	-.7885	-.0939

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 34 DF = 2.033

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.75354	4	2.68839	72.106
RESIDUAL	1.26765	34	.03728	
CORRECTION FACTOR	2409.09001	1		

MULTIPLE CORRELATION COEFFICIENT = .946
R SQUARED FACTOR = .895
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
      QEI[1]←1
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT        ** 1
ENTER WEIGHT VECTOR OR MATRIX  ** M[;2]     PAINOTETTU NILLA
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0

                REGRESSION ANALYSIS TABLE

   SOURCE                    SS          DF          MS          F
TOTAL (CORRECTED)            .08880      38          .00234
REGRESSION (CORRECTED)       .05122       3          .01707     15.906
RESIDUAL                     .03757      35          .00107

CORRECTION FACTOR          61.05089       1

MULTIPLE CORRELATION COEFFICIENT =      .760
R SQUARED FACTOR                 =      .577
THE SIGNIFICANCE OF REGRESSION   =  1.00000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

THE TRANSFORMATION MATRIX (VECTOR) IS NAMED E
      QEI[1]←0
```

.1 STEP M
STEPWISE REGRESSION

LIITE 3E

NUMBER OF VARIABLES IS: 7
NUMBER OF RESPONSES IS: 39
F-LEVEL FOR ENTERING IS: 0.1
F-LEVEL FOR LEAVING IS: 0.1
MAXIMUM NO. OF STEPS IS: 7

STEP 1
ENTERING VARIABLE IS: 5. RESIDUAL VARIANCE IS: 0.04343
COMPUTED F IS : 239.765 WITH DF: 1 37
COMPUTED F LEVEL IS : .000

VAR.	COEFFICIENT	STD.ERR.	T	F
CONSTANT	5.907	.130	45.275	2049.855
5	.004	.000	15.484	239.765

NO VARIABLE IS DROPPED.

STEP 2
ENTERING VARIABLE IS: 6. RESIDUAL VARIANCE IS: 0.03566
COMPUTED F IS : 9.066 WITH DF: 1 36
COMPUTED F LEVEL IS : .005

VAR.	COEFFICIENT	STD.ERR.	T	F
CONSTANT	5.987	.121	49.410	2441.311
5	.004	.000	17.317	299.877
6	-.313	.104	-3.011	9.066

NO VARIABLE IS DROPPED.

STEP 3
ENTERING VARIABLE IS: 7. RESIDUAL VARIANCE IS: 0.02852
COMPUTED F IS : 10.011 WITH DF: 1 35
COMPUTED F LEVEL IS : .003

VAR.	COEFFICIENT	STD.ERR.	T	F
CONSTANT	6.119	.116	52.675	2774.701
5 $(V-w_1)^2$	.004	.000	19.015	361.585
6 w_2	-1.218	.301	-4.051	16.407
7 w_2^2	1.020	.322	3.164	10.011

NO VARIABLE IS DROPPED.

STEP 4

SEARCH ENDS. FINAL COMPUTED F LEVEL TO ENTER: .215
FINAL REJECTED CANDIDATE IS 7 WITH COMPUTED F= 10.011 AND DF= 1 34

FINAL SET: 5 6 7

VAR.	COEFFICIENT	STD.ERR.	T	F
CONSTANT	6.119	.116	52.675	2774.701
5	.004	.000	19.015	361.585
6	-1.218	.301	-4.051	16.407
7	1.020	.322	3.164	10.011

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	11.02293	3	3.67431	128.826
RESIDUAL	.99826	35	.02852	
CORRECTION FACTOR	2409.09001	1		

MULTIPLE CORRELATION COEFFICIENT = .958
R SQUARED FACTOR = .917
THE SIGNIFICANCE OF REGRESSION = 1.00000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
      V5S2
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2  W2      W2**2
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.0014	.4829	6.2151	2.0429	3.9598
B1	37.6918	7.1230	5.2916	23.5552	51.8285
B2	.0048	.0003	14.8190	.0042	.0054

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.02083	2	10.01042	259.782
RESIDUAL	3.81485	99	.03853	
CORRECTION FACTOR	5182.79732	1		

MULTIPLE CORRELATION COEFFICIENT = .916
R SQUARED FACTOR = .840
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	4.4398	3.0089	1.4755	-1.5327	10.4123
B1	22.8036	31.5576	.7226	-39.8355	85.4426
B2	.0049	.0003	14.1769	.0042	.0055
B3	-.0353	.0730	-.4844	-.1802	.1095

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.02994	3	6.67665	171.928
RESIDUAL	3.80574	98	.03883	
CORRECTION FACTOR	5182.79732	1		

MULTIPLE CORRELATION COEFFICIENT = .917
R SQUARED FACTOR = .840
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	6.6083	.2191	30.1573	6.1734	7.0431
B1	¯.0867	.0165	¯5.2565	¯.1194	¯.0540
B2	.0049	.0003	14.3830	.0042	.0056

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.00966	2	10.00483	258.880
RESIDUAL	3.82602	99	.03865	
CORRECTION FACTOR	5182.79732	1		

MULTIPLE CORRELATION COEFFICIENT = .916
R SQUARED FACTOR = .839
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	7.4870	.2972	25.1917	6.8971	8.0769
B1	¯.1578	.0233	¯6.7807	¯.2039	¯.1116
B2	.0065	.0005	12.7764	.0055	.0075
B3	¯.3848	.0947	¯4.0615	¯.5728	¯.1967

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.56090	3	6.85363	205.100
RESIDUAL	3.27478	98	.03342	
CORRECTION FACTOR	5182.79732	1		

MULTIPLE CORRELATION COEFFICIENT = .929
R SQUARED FACTOR = .863
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	1.3337	.6544	2.0381	.0348	2.6326
B1	62.4875	9.6921	6.4472	43.2494	81.7255
B2	.0061	.0005	12.9347	.0051	.0070
B3	¯.3248	.0913	¯3.5587	¯.5059	¯.1436

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.45739	3	6.81913	197.814
RESIDUAL	3.37829	98	.03447	
CORRECTION FACTOR	5182.79732	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .926
R SQUARED FACTOR                 =     .858
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	6.3175	2.8423	2.2227	.6751	11.9599
B1	12.2132	29.5176	.4138	¯46.3843	70.8107
B2	¯.1296	.0720	¯1.8007	¯.2725	.0133
B3	.0065	.0005	12.5399	.0054	.0075
B4	¯.3812	.0955	¯3.9908	¯.5708	¯.1916

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 97 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.56667	4	5.14167	152.567
RESIDUAL	3.26901	97	.03370	
CORRECTION FACTOR	5182.79732	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .929
R SQUARED FACTOR                 =     .863
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      V552
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 FA      V      1/V      V**2      W1   (V-W1)**2   W2      W2**2
      REGGY ,05
INPUT THE    DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 6 2]
 INPUT THE DEGREE OF FIT        ** 1
ENTER WEIGHT VECTOR OR MATRIX   ** M[;2]
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0

                    REGRESSION ANALYSIS TABLE

  SOURCE                          SS          DF          MS          F
TOTAL (CORRECTED)                .12532      101        .00124
REGRESSION (CORRECTED)           .08767        3        .02922     76.049
RESIDUAL                         .03766       98        .00038

CORRECTION FACTOR              50.30417        1

MULTIPLE CORRELATION COEFFICIENT =      .836
R SQUARED FACTOR                 =      .700
THE SIGNIFICANCE OF REGRESSION   = 1.00000
 (SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

THE TRANSFORMATION MATRIX (VECTOR) IS NAMED E
      DPF
ENTRY ERROR
      ⍝EI[1]←1
```

```
      QCI[1]←0
      ,1 STEP M
STEPWISE REGRESSION

NUMBER  OF VARIABLES IS: 7
NUMBER OF  RESPONSES IS: 102
F-LEVEL FOR ENTERING IS: 0.1
F-LEVEL FOR  LEAVING IS: 0.1
MAXIMUM NO, OF STEPS IS: 7

STEP 1
ENTERING VARIABLE IS: 5, RESIDUAL VARIANCE IS: 0.04894
COMPUTED F IS        :  387.055 WITH DF: 1 100
COMPUTED F LEVEL IS  :  .000

 VAR,     COEFFICIENT    STD,ERR,        T           F
CONSTANT      5.526          .084       65.520     4292.815
  5            .003          .000       19.674      387.055
NO VARIABLE IS DROPPED,

STEP 2
ENTERING VARIABLE IS: 2, RESIDUAL VARIANCE IS: 0.03853
COMPUTED F IS        :   28.001 WITH DF: 1 99
COMPUTED F LEVEL IS  :  .000

 VAR,     COEFFICIENT    STD,ERR,        T           F
CONSTANT      3.001          .483        6.215       38.627
  5            .005          .000       14.819      219.603
  2          37.692         7.123        5.292       28.001
NO VARIABLE IS DROPPED,

STEP 3
ENTERING VARIABLE IS: 6, RESIDUAL VARIANCE IS: 0.03145
COMPUTED F IS        :   23.302 WITH DF: 1 98
COMPUTED F LEVEL IS  :  .000

 VAR,     COEFFICIENT    STD,ERR,        T           F
CONSTANT      1.613          .523        3.086       9.523
  5            .006          .000       15.894      252.604
  2          59.309         7.840        7.565      57.230
  6           ¯.334          .069       ¯4.827      23.302
NO VARIABLE IS DROPPED,

STEP 4
ENTERING VARIABLE IS: 7, RESIDUAL VARIANCE IS: 0.02956
COMPUTED F IS        :    7.255 WITH DF: 1 97
COMPUTED F LEVEL IS  :  .008

 VAR,     COEFFICIENT    STD,ERR,        T           F
CONSTANT      3.031          .731        4.148       17.204
  5            .005          .001        9.567       91.527
  2          39.759        10.510        3.783       14.311
  6           ¯.864          .208       ¯4.157      17.277
  7            .705          .262        2.694       7.255
NO VARIABLE IS DROPPED,

STEP 5

SEARCH ENDS, FINAL COMPUTED F LEVEL TO ENTER:  .491
FINAL REJECTED CANDIDATE IS 7 WITH COMPUTED F=    7.255 AND DF= 1 96
```

FINAL SET: 5 2 6 7

VAR.		COEFFICIENT	STD.ERR.	T	F
CONSTANT		3.031	.731	4.148	17.204
5	$(v-w_1)^2$	.005	.001	9.567	91.527
2	$1/v$	39.759	10.510	3.783	14.311
6	w_2	-.864	.208	-4.157	17.277
7	w_2^2	.705	.262	2.694	7.255

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.96813	4	5.24203	177.321
RESIDUAL	2.86756	97	.02956	
CORRECTION FACTOR	5182.79732	1		

MULTIPLE CORRELATION COEFFICIENT = .938
R SQUARED FACTOR = .880
THE SIGNIFICANCE OF REGRESSION = 1.00000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
      V551
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 FA     V     1/V      V**2      W1   (V-W1)**2  W2      W2**2
                                                          W2^4

      M[;8]←M[;8]×M[;8]
      REGGY ,05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	4.2622	.2700	15.7860	3.7263	4.7981
B1	.0149	.0239	.6232	¯.0325	.0623
B2	.0030	.0005	5.5043	.0019	.0040
B3	¯.0268	.0944	¯.2835	¯.2141	.1606

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.01762	3	6.00587	204.152
RESIDUAL	2.88303	98	.02942	
CORRECTION FACTOR	3603.79965	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .928
R SQUARED FACTOR                 =     .862
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      V552
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V     V**2      W1   (V-W1)**2   W2
      M[;8]←M[;8]×M[;8]
      REGGY .05
INPUT THE    DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 6 8]
INPUT THE DEGREE OF FIT        ** $R1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	6.8248	.3442	19.8300	6.1417	7.5079
B1	¯.1054	.0282	¯3.7345	¯.1614	¯.0494
B2	.0053	.0006	8.5263	.0041	.0065
B3	¯.0966	.1183	¯.8169	¯.3314	.1382

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.03554	3	6.67851	172.229
RESIDUAL	3.80014	98	.03878	
CORRECTION FACTOR	5182.79732	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .917
R SQUARED FACTOR                 =     .841
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      V451
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2   W2      W2**2
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;6 7]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	4.3941	.1169	37.5884	4.1569	4.6312
B1	.0048	.0002	23.2871	.0043	.0052
B2	.2308	.0881	2.6202	.0521	.4095

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	13.93108	2	6.96554	279.175
RESIDUAL	.89822	36	.02495	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .969
R SQUARED FACTOR                 =     .939
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** 8
ENTRY ERROR
                                  M[;6 7 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	4.3942	.1182	37.1631	4.1541	4.6343
B1	.0048	.0002	22.1192	.0043	.0052
B2	.1108	.2905	.3814	-.4790	.7006
B3	.1380	.3180	.4341	-.5077	.7838

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	14.82929	38	.39024	
REGRESSION (CORRECTED)	13.93589	3	4.64530	181.984
RESIDUAL	.89341	35	.02553	
CORRECTION FACTOR	1733.86671	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .969
R SQUARED FACTOR                 =     .940
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      V5S1
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA       V       1/V       V**2       W1   (V-W1)**2   W2       W2**2
      REGGY .05
INPUT THE    DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;6 7 8]
INPUT THE DEGREE OF FIT         ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	4.3572	.0752	57.9435	4.2079	4.5064
B1	.0033	.0001	23.8129	.0030	.0036
B2	.2857	.1740	1.6416	-.0597	.6311
B3	-.2111	.1854	-1.1387	-.5791	.1569

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	20.90065	101	.20694	
REGRESSION (CORRECTED)	18.13357	3	6.04452	214.075
RESIDUAL	2.76708	98	.02824	
CORRECTION FACTOR	3603.79965	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .931
R SQUARED FACTOR                 =     .868
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      V4S2
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET;
 PA      V      1/V      V**2      W1   (V-W1)**2  W2      W2**2
      REGGT .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;6 7]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	5.9867	.1212	49.4096	5.7409	6.2325
B1	.0042	.0002	17.3170	.0037	.0047
B2	¯.3134	.1041	¯3.0110	¯.5246	¯.1023

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	12.02119	38	.31635	
REGRESSION (CORRECTED)	10.73741	2	5.36871	150.551
RESIDUAL	1.28378	36	.03566	
CORRECTION FACTOR	2409.09001	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .945
R SQUARED FACTOR                 =     .893
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      VS52
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2   W2      W2**2
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;6 7]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	5.5321	.0856	64.6319	5.3622	5.7020
B1	.0033	.0002	18.9444	.0030	.0036
B2	¯.0350	.0711	¯.4921	¯.1761	.1061

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	18.95379	2	9.47689	192.182
RESIDUAL	4.88189	99	.04931	
CORRECTION FACTOR	5182.79732	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .892
R SQUARED FACTOR                 =     .795
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;6 7 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

	COEFFICIENT		B/SIGMA(B)	CONFIDENCE INTERVAL	
TERM	B	SIGMA(B)	T	LOWER	UPPER
B0	5.7809	.0793	72.8645	5.6234	5.9383
B1	.0030	.0001	20.5357	.0028	.0033
B2	¯1.2729	.1892	¯6.7294	¯1.6484	¯.8975
B3	1.3892	.2018	6.8841	.9886	1.7897

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	23.83568	101	.23600	
REGRESSION (CORRECTED)	20.54506	3	6.84835	203.955
RESIDUAL	3.29062	98	.03358	
CORRECTION FACTOR	5182.79732	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .928
R SQUARED FACTOR                 =     .862
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      V4ET
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 FA      V      1/V      V**2      W1   (V-W1)**2   W2      W2**2
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 4]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	1.2821	1.3012	.9853	¯1.3574	3.9216
B1	54.9423	18.2442	3.0115	17.9327	91.9519
B2	.0072	.0009	7.6989	.0053	.0092

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = 2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	11.27870	38	.29681	
REGRESSION (CORRECTED)	10.85901	2	5.42950	465.732
RESIDUAL	.41969	36	.01166	
CORRECTION FACTOR	2057.62970	1		

MULTIPLE CORRELATION COEFFICIENT = .981
R SQUARED FACTOR = .963
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 4]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	9.0635	1.2782	7.0908	6.4706	11.6565
B1	¯.3640	.1201	¯3.0312	¯.6075	¯.1204
B2	.0129	.0028	4.6245	.0072	.0185

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 36 DF = ¯2.029

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	11.27870	38	.29681	
REGRESSION (CORRECTED)	10.86012	2	5.43006	467.011
RESIDUAL	.41858	36	.01163	
CORRECTION FACTOR	2057.62970	1		

MULTIPLE CORRELATION COEFFICIENT = .981
R SQUARED FACTOR = .963
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY ,05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	1.2649	1.3240	.9553	¯1.4237	3.9534
B1	55.1250	18.5357	2.9740	17.4868	92.7633
B2	.0073	.0010	7.5839	.0053	.0092
B3	.0096	.0629	.1524	¯.1181	.1373

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	11.27870	38	.29681	
REGRESSION (CORRECTED)	10.85929	3	3.61976	302.072
RESIDUAL	.41941	35	.01198	
CORRECTION FACTOR	2057.62970	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .981
R SQUARED FACTOR                 =     .963
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY ,05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
¯+\}( THE INDEPENDENT VARIABLE ** M[;2 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	9.0725	1.2972	6.9941	6.4385	11.7065
B1	¯.3652	.1220	¯2.9937	¯.6129	¯.1175
B2	.0129	.0028	4.5613	.0072	.0186
B3	.0098	.0628	.1561	¯.1177	.1373

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	11.27870	38	.29681	
REGRESSION (CORRECTED)	10.86041	3	3.62014	302.911
RESIDUAL	.41829	35	.01195	
CORRECTION FACTOR	2057.62970	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .981
R SQUARED FACTOR                 =     .963
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** APU←M[;1 2 3 4 7 8]
```

```
      )COPY 42 STAT7A
SAVED 17:04:50 11/16/80


      APU←M[;1 2 3 4 7 8]
      .1 STEP APU
STEPWISE REGRESSION

NUMBER  OF VARIABLES IS: 5
NUMBER OF  RESPONSES IS: 39
F-LEVEL FOR ENTERING IS: 0.1
F-LEVEL FOR  LEAVING IS: 0.1
MAXIMUM NO. OF STEPS IS: 5

STEP 1
ENTERING VARIABLE IS: 3. RESIDUAL VARIANCE IS: 0.0142
COMPUTED F IS        :  757.252 WITH DF: 1 37
COMPUTED F LEVEL IS  :  .000

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      5.195          .078       66.978    4486.085
  3            .004          .000       27.518     757.252
NO VARIABLE IS DROPPED.

STEP 2
ENTERING VARIABLE IS: 1. RESIDUAL VARIANCE IS: 0.01163
COMPUTED F IS        :    9.188 WITH DF: 1 36
COMPUTED F LEVEL IS  :  .005

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      9.064          1.278       7.091     50.279
  3            .013           .003       4.625     21.386
  1           ¯.364           .120      ¯3.031      9.188
NO VARIABLE IS DROPPED.

STEP 3

SEARCH ENDS. FINAL COMPUTED F LEVEL TO ENTER:  .439
FINAL REJECTED CANDIDATE IS 1 WITH COMPUTED F=    9.188 AND DF= 1 35

FINAL SET:  3  1

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      9.064          1.278       7.091     50.279
  3            .013           .003       4.625     21.386
  1           ¯.364           .120      ¯3.031      9.188


                    REGRESSION ANALYSIS TABLE

   SOURCE                      SS          DF         MS          F
TOTAL (CORRECTED)          11.27870        38         .29681
REGRESSION (CORRECTED)     10.86012         2        5.43006    467.011
RESIDUAL                     .41858        36         .01163

CORRECTION FACTOR         2057.62970         1

MULTIPLE CORRELATION COEFFICIENT -      .981
```

```
0 PREDICT 13.9 193.2 16.7 277.8 19.4 377.9 22.2 493.7 25 625 27.8 771.6
CONFIDENCE LIMITS FOR MEAN VALUE OF Y
      X                    X                PREDICTED Y        STD.DEV.        CO
NFIDENCE INTERVAL                                                              LO
      1                    2
WER                  UPPER
 13.90000             193.20000            5.89247            .11075          5.67
267                  6.11228
 16.70000             277.80000            5.99795            .04071          5.91
716                  6.07874
 19.40000             377.90000            6.23695            .01574          6.20
572                  6.26818
 22.20000             493.70000            6.57370            .01760          6.53
876                  6.60864
 25.00000             625.00000            7.02534            .02096          6.98
375                  7.06694
 27.80000             771.60000            7.59040            .06465          7.46
208                  7.71872
THE GLOBAL MATRIX IK CONTAINS THE LOWER BAND,PREDICTIONS AND UPPER BAND
THE RISK LEVEL OF PREDICTION IS: 0.05

MAX OF X DATA-MATRIX : 25.69305556 660.1377353
MIN OF X DATA-MATRIX : 17.81666667 317.4347222
THE FOLLOWING X VALUES ARE OUTSIDE EXPERIMENTAL RANGE:13.9 193.2 16.7 27
 7.8 27.8 771.6
```

```
      V4ET
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 FA     V      1/V      V**2      W1   (V-W1)**2   W2
      M[;8]←M[;8]×M[;8]
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	9.1601	1.2837	7.1358	6.5535	11.7667
B1	¯.3749	.1208	¯3.1048	¯.6201	¯.1297
B2	.0131	.0028	4.6917	.0074	.0188
B3	.0636	.0664	.9571	¯.0713	.1984

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	11.27870	38	.29681	
REGRESSION (CORRECTED)	10.87079	3	3.62360	310.920
RESIDUAL	.40790	35	.01165	
CORRECTION FACTOR	2057.62970	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .982
R SQUARED FACTOR                 =     .964
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	1.1448	1.3108	.8733	¯1.5169	3.8065
B1	56.5909	18.3495	3.0841	19.3308	93.8510
B2	.0073	.0009	7.7471	.0054	.0093
B3	.0634	.0665	.9526	¯.0717	.1984

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 35 DF = 2.031

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	11.27870	38	.29681	
REGRESSION (CORRECTED)	10.86962	3	3.62321	309.993
RESIDUAL	.40908	35	.01169	
CORRECTION FACTOR	2057.62970	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .982
R SQUARED FACTOR                 =     .964
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      VSET
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2   W2      W2**2
      REGGY ,05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 4]
INPUT THE DEGREE OF FIT         ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.0476	.9204	3.3111	1.2209	4.8743
B1	28.3984	12.9864	2.1868	2.6248	54.1720
B2	.0045	.0007	6.9097	.0032	.0059

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	13.94060	2	6.97030	456.935
RESIDUAL	1.51019	99	.01525	
CORRECTION FACTOR	4357.53813	1		

MULTIPLE CORRELATION COEFFICIENT = .950
R SQUARED FACTOR = .902
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY ,05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
DATA LOST, REENTER

REGGY ,05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 4]
INPUT THE DEGREE OF FIT         ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	7.0499	.9167	7.6906	5.2306	8.8692
B1	-.1863	.0856	-2.1770	-.3561	-.0165
B2	.0074	.0020	3.7600	.0035	.0113

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 99 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	13.93998	2	6.96999	456.728
RESIDUAL	1.51081	99	.01526	
CORRECTION FACTOR	4357.53813	1		

MULTIPLE CORRELATION COEFFICIENT = .950
R SQUARED FACTOR = .902
THE SIGNIFICANCE OF REGRESSION = 1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

```
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.0722	.8955	3.4306	1.2947	4.8498
B1	27.5413	12.6392	2.1790	2.4536	52.6291
B2	.0045	.0006	7.0306	.0032	.0058
B3	.0991	.0386	2.5664	.0225	.1758

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	14.03571	3	4.67857	324.009
RESIDUAL	1.41509	98	.01444	
CORRECTION FACTOR	4357.53813	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .953
R SQUARED FACTOR                 =     .908
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	6.9547	.8926	7.7913	5.1829	8.7265
B1	-.1808	.0833	-2.1705	-.3461	-.0155
B2	.0073	.0019	3.7964	.0035	.0111
B3	.0992	.0386	2.5674	.0225	.1758

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	14.03520	3	4.67840	323.880
RESIDUAL	1.41560	98	.01444	
CORRECTION FACTOR	4357.53813	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .953
R SQUARED FACTOR                 =     .908
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```

```
      APU←M[;1 2 3 4 7 8]
      )COPY 42 STAT7A
SI DAMAGE
SAVED 17:04:50 11/16/80
      .1 STEP APU
STEPWISE REGRESSION

NUMBER OF VARIABLES IS: 5
NUMBER OF RESPONSES IS: 102
F-LEVEL FOR ENTERING IS: 0.1
F-LEVEL FOR LEAVING IS: 0.1
MAXIMUM NO. OF STEPS IS: 5

STEP 1
ENTERING VARIABLE IS: 3. RESIDUAL VARIANCE IS: 0.01583
COMPUTED F IS        : 875.959 WITH DF: 1 100
COMPUTED F LEVEL IS  : .000

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      5.057          .051      98.204    9644.011
  3            .003          .000      29.597     875.959
NO VARIABLE IS DROPPED.

STEP 2
ENTERING VARIABLE IS: 5. RESIDUAL VARIANCE IS: 0.01499
COMPUTED F IS        :   6.639 WITH DF: 1 99
COMPUTED F LEVEL IS  : .011

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      5.020          .052      96.363    9285.889
  3            .003          .000      30.408     924.626
  5            .101          .039       2.577       6.639
NO VARIABLE IS DROPPED.

STEP 3
ENTERING VARIABLE IS: 4. RESIDUAL VARIANCE IS: 0.01261
COMPUTED F IS        :  19.690 WITH DF: 1 98
COMPUTED F LEVEL IS  : .000

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      5.091          .050     101.045   10210.149
  3            .003          .000      33.234    1104.506
  5            .608          .120       5.077      25.779
  4           ¯.509          .115      ¯4.437      19.690
NO VARIABLE IS DROPPED.

STEP 4
ENTERING VARIABLE IS: 2. RESIDUAL VARIANCE IS: 0.01206
COMPUTED F IS        :   5.405 WITH DF: 1 97
COMPUTED F LEVEL IS  : .021

 VAR.     COEFFICIENT    STD.ERR.        T          F
CONSTANT      3.191          .819       3.896      15.179
  3            .004          .001       7.647      58.477
  5            .603          .117       5.142      26.436
  4           ¯.505          .112      ¯4.505      20.297
  2          26.861        11.554       2.325       5.405
NO VARIABLE IS DROPPED.
```

STEP 5

SEARCH ENDS, FINAL COMPUTED F LEVEL TO ENTER: .837
FINAL REJECTED CANDIDATE IS 2 WITH COMPUTED F= 5.405 AND DF= 1 96

FINAL SET: 3 5 4 2

VAR,	COEFFICIENT	STD.ERR.	T	F
CONSTANT	3.191	.819	3.896	15.179
3	.004	.001	7.647	58.477
5	.603	.117	5.142	26.436
4	-.505	.112	-4.505	20.297
2	26.861	11.554	2.325	5.405

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	14.28057	4	3.57014	295.930
RESIDUAL	1.17022	97	.01206	
CORRECTION FACTOR	4357.53813	1		

MULTIPLE CORRELATION COEFFICIENT = .961
R SQUARED FACTOR = .924
THE SIGNIFICANCE OF REGRESSION = 1.00000
(SIGNIFICANCE; AREA UNDER CURVE FROM 0 TO COMPUTED F)

```
      0 PREDICT .072 193.2 .06 277.8 .051 377.9 .045 493.7 .04 625 .036 771
CONFIDENCE LIMITS FOR MEAN VALUE OF Y
          X                X          PREDICTED Y        STD,DEV,           CO
      NFIDENCE INTERVAL
          1                2                                                LO
      WER              UPPER
 50       .07200          193.20000        6.63734          .19866          6.23
      434             7.04034
 60       .06000          277.80000        6.59082          .06262          6.46
      380             6.71784
 70       .05100          377.90000        6.82139          .02781          6.76
      497             6.87781
 86       .04500          493.70000        7.33051          .02636          7.27
      703             7.38398
 90       .04000          625.00000        8.00684          .03119          7.94
      357             8.07010
 100      .03600          771.60000        8.84893          .08873          8.66
      894             9.02892
THE GLOBAL MATRIX YK CONTAINS THE LOWER BAND,PREDICTIONS AND UPPER BAND
THE RISK LEVEL OF PREDICTION IS; 0.05

MAX OF X DATA-MATRIX : 0.05633822685 656.640625
MIN OF X DATA-MATRIX : 0.03902439024 315.0636111
THE FOLLOWING X VALUES ARE OUTSIDE EXPERIMENTAL RANGE;0.072 193.2 0.06 2
     77.8 0.036 771.6
```

```
      V5ET
SINULLA ON NYT MATRIISI M, JOKA SISALTAA SARAKKEET:
 PA      V      1/V      V**2      W1   (V-W1)**2   W2
      M[;8]←M[;8]×M[;8]
      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;2 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	6.9041	.8584	8.0427	5.2002	8.6080
B1	¯.1758	.0801	¯2.1953	¯.3348	¯.0169
B2	.0072	.0018	3.8865	.0035	.0108
B3	.1475	.0379	3.8872	.0722	.2228

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	14.14181	3	4.71394	352.919
RESIDUAL	1.30899	98	.01336	
CORRECTION FACTOR	4357.53813	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .957
R SQUARED FACTOR                 =     .915
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0

      REGGY .05
INPUT THE   DEPENDENT VARIABLE ** M[;1]
INPUT THE INDEPENDENT VARIABLE ** M[;3 4 8]
INPUT THE DEGREE OF FIT        ** 1
TYPE 1 FOR CROSSTERMS,0 IF NOT ** 0
```

TERM	COEFFICIENT B	SIGMA(B)	B/SIGMA(B) T	CONFIDENCE INTERVAL LOWER	UPPER
B0	3.1257	.8613	3.6290	1.4161	4.8353
B1	26.8137	12.1560	2.2058	2.6851	50.9424
B2	.0045	.0006	7.2530	.0032	.0057
B3	.1475	.0379	3.8877	.0722	.2227

THE THEORETICAL VALUE FOR T AT THE 0.025 LEVEL AND 98 DF = 1.985

REGRESSION ANALYSIS TABLE

SOURCE	SS	DF	MS	F
TOTAL (CORRECTED)	15.45080	101	.15298	
REGRESSION (CORRECTED)	14.14240	3	4.71413	353.092
RESIDUAL	1.30840	98	.01335	
CORRECTION FACTOR	4357.53813	1		

```
MULTIPLE CORRELATION COEFFICIENT =     .957
R SQUARED FACTOR                 =     .915
THE SIGNIFICANCE OF REGRESSION   =  1.0000
(SIGNIFICANCE: AREA UNDER CURVE FROM 0 TO COMPUTED F)

TYPE 1 FOR MORE REGRESSION, 0 TO STOP ** 0
```